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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte THIERRY BRIZARD and JEAN-PAUL GRUFFEILLE

Appeal 2015-007373
Application 13/736,342
Technology Center 3600

Before ANNETTE R. REIMERS, THOMAS F. SMEGAL, and LISA M. GUIJT, *Administrative Patent Judges*.

GUIJT, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants[1] seek our review under 35 U.S.C. § 134 of the Examiner's decision rejecting claims 1–5, 7–11, 13–19, and 21–25.[2, 3] We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE and enter NEW GROUNDS OF REJECTION pursuant to our authority under 37 C.F.R. § 41.50(b).

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[1] Appellants identify the real party in interest as CGGVERITAS SERVICES SA. Appeal Br. 2.

[2] Appeal is taken from the Non-Final Office Action dated August 7, 2014 ("Non-Final Act.").

[3] Appellants identify the appeal of US Application No. 13/736,331 as a related appeal. Appeal Br. 2.

CLAIMED SUBJECT MATTER

Claims 1, 10, 11, 21, 22, 23, 24, and 25 are independent. Claim 1 is reproduced below.

> 1. A seismic survey system for recording seismic data underwater in the presence of underwater currents, the system comprising:
>
> first plural buoys configured to descend in water to a predetermined depth (H1), at least on buoy having a seismic receiver for recording the seismic data, a buoyancy system for maintaining the predetermined depth (H1), and a propulsion system for adjusting its horizontal position;
>
> a first vessel configured to launch the first plural buoys along a first line;
>
> a second vessel configured to recover the first plural buoys at a second line,
>
> wherein there is a predetermined distance between the first and second lines,
>
> wherein the first plural buoys are configured to travel underwater, at substantially the first predetermined depth (H1), from the first line to the second line, due to a combination of the underwater currents and the propulsion system, and
>
> a computer system configured to calculate the underwater current prior to launching the first plural buoys and to determine a positon of the second line,
>
> wherein the computer system calculates the underwater currents based on historic data.

REJECTIONS

I. Claims 1, 2, 4, and 7 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt (US 5,894,450; iss. Apr. 13, 1999), Welker (US

2011/0266086 A1; pub. Nov. 3, 2011), Brunet (US 6,618,321 B2; iss. Sept. 9, 2003), and Bellingham (Bellingham et al., A Small, Long-Range Autonomous Vehicle for Deep Ocean Exploration, PROCEEDINGS OF THE SECOND INTERNATIONAL OFFSHORE AND POLAR ENGINEERING CONFERENCE (1992)).

II. Claim 3 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Brunet, Bellingham, and Ray (US 2008/0192569 A1; pub. Aug. 14, 2008).

III. Claim 5 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Brunet, Bellingham, and Rouquette (US 7,176,589 B2; iss. Feb. 13, 2007).

IV. Claim 8 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Brunet, Bellingham, and DeKok (US 6,493,636 B1; iss. Dec. 10, 2002).

V. Claim 9 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Brunet, Bellingham, and Dragoset (US 4,992,992; iss. Feb. 12, 1991).

VI. Claim 10 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Brunet, and Bellingham.[4]

[4] The Examiner implies that the inclusion of Lockwood (US 4,929,124; iss. May 29, 1990) is an "inadvertent typographical error." Ans. 14. Indeed, there are no findings made by the Examiner (*see* Non-Final Act. 18–24); thus, we omit Lockwood from the Examiner's rejection.

VII. Claims 11 and 14 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, and Bellingham.

VIII. Claim 13 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Bellingham, and Rouquette.

IX. Claim 15 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Bellingham, Bogue (*SOAR Range Validation Test: Autonomous Buoyancy-Driven Gliders, Autonomous Surface Vehicles, and Autonomous Profiling Floats*, Office of Naval Research (2011)), and Robertsson (US 6,775,618 B1; iss. Aug. 10, 2004).

X. Claim 16 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Bellingham, and Bogue.

XI. Claims 17, 21, and 23 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Bellingham, and DeKok.

XII. Claims 18, 22, and 24 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Bellingham, and Dragoset.

XIII. Claims 19 and 25 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Schmidt, Welker, Bellingham, and Vigen (US 7,417,924 B2; iss. Aug. 26, 2008).

ANALYSIS

Rejection I

Independent claim 1

Regarding independent claim 1, the Examiner finds that because Schmidt teaches that AUVs[5] "can drift rather than operate under propulsion," Schmidt suggests that "the underwater apparatus are buoys." Non-Final Act. 9 (citing Schmidt 8:43–46). The Examiner also determines that because Schmidt discloses the presence of ships (Schmidt 4:46–47, 61–62) and the deployment of small, low-cost AUVs at sea for deep sea use (*id.* at 2:26–31, 6:16–18), and because "in this art, [AUVs] would not proceed under their own power from shore to an exploration site," Schmidt inherently teaches a first vessel configured to launch the AUVs. *Id.* at 8. The Examiner further determines that because AUVs would be consecutively launched from the same ship while the ship is underway, Schmidt inherently teaches launching the AUVs along a first line. *Id.*

Appellants argue that "UAVs are not buoys," and that "one of ordinary skill in the art might classify the UAVs of Schmidt as more of a submarine than a buoy." Appeal Br. 20.

During patent examination, claims are to be given their broadest reasonable interpretation consistent with the specification, with claim language being read in light of the specification as it would be interpreted by one of ordinary skill in the art. *See In re Am. Acad. of Sci. Tech Ctr.*, 367

[5] Autonomous Underwater Vehicles. *See, e.g.*, Schmidt 4:14–15.

F.3d 1359, 1364 (Fed. Cir. 2004). The Specification discloses that the buoys have a seismic receiver (i.e., a hydrophone) for recording the seismic data (Spec. ¶ 34) and a buoyancy system configured to control the buoyancy of the buoy body for traveling underwater at a specific depth (*id.* ¶ 16), and also, optionally, a control unit including a processor, memory, and differential global positioning system (*id.* ¶ 41), a processor to control the vertical speed of the buoy (*id.* ¶ 51), wherein the processor is connected to a battery, clock module, RF beacon and antenna (*id.* ¶ 52), an inertial device, a propulsion system with a motor and propeller (*id.* ¶ 56), and a communication interface (*id.* ¶ 58). *See id.*, Fig. 9. An ordinary definition of the claim term "buoy" is "an object floating in a body of water and moored to the bottom to mark a channel or to point out the position of something beneath the water (as an anchor, rock, or shoal)." WEBSTER'S THIRD NEW INT'L DICTIONARY 297 (1993). Notably, Appellants' invention as recited in claims 1 and 10 would not be able to travel underwater from a first to a second line due to underwater currents if the buoys were moored to the bottom of the body of water. Thus, a broadest reasonable interpretation consistent with Appellants' Specification of the claim term "buoy" is "an object floating in a body of water that marks the position of something."

Schmidt discloses two or more underwater vehicles disposed in an array for sensing ocean parameters. Schmidt, Abstract. Schmidt discloses that "while the array of FIGS. **1** and **2** utilizes autonomous underwater vehicles [(or AUVs)], underwater arrays in accordance with the invention may utilize manned, tethered and/or autonomous underwater vehicles, or

combinations of such vehicles." Schmidt 6:45–49. Schmidt describes an AUV as having a hull, an electronics sphere, a battery sphere, a propulsion system, and typically, a sensor such as a hydrophone, wherein "[t]he vehicle is autonomous in the sense that it may move to any X-Y coordinates and depth within the ocean volume being monitored." *Id.* at 6:13–23, 27–28, 32–35. Although Schmidt discloses that "when the noise of the AUV motors interferes with sensor data acquisition, the AUV motors can be turned off, allowing the AUVs to drift" (*id.* at 8:43–46), and thus, the AUV must have some inherent buoyancy, we agree with Appellants that Schmidt does not disclose that the AUV is a buoy, or an object floating in a body of water that marks the position of something. Therefore, we determine that the Examiner erred in finding that Schmidt's AUV is a buoy, and further, that the Examiner has not provided support for the finding that Schmidt suggests using a modified buoy as the AUV or that it would be obvious to do so.

Appellants also argue, *inter alia*, that Schmidt fails to inherently disclose that a first vessel is configured to launch the first plural buoy along a first line, because Schmidt does not describe how the AUVs are deployed, and that, for example, it is possible that the AUVs are deployed by a drilling rig. Appeal Br. 21–23; *see also* Reply Br. 2 ("it is not understood how launch from a ship is 'necessarily present' in Schmidt"). Because Schmidt is silent regarding how the arrays of AUVs are launched and recovered, we agree with Appellants that the Examiner's findings of inherency are speculative and not supported by a preponderance of the evidence.

Accordingly, we do not sustain the Examiner's rejection of independent claim 1, and claims 2, 4, and 7 depending therefrom, under 35 U.S.C. § 103(a), as unpatentable over Schmidt, Welker, Brunet, and Bellingham.

Rejections II–V

Claims 3, 5, 8, and 9 depend from independent claim 1. The Examiner's findings with respect to Ray, Rouquette, DeKok, and Dragoset fail to cure the deficiencies in the Examiner's findings with respect to Schmidt as discussed *supra*. *See* Non-Final Act. 14–18. Therefore, we also do not sustain the Examiner's rejections of claims 3, 5, 8, and 9, under 35 U.S.C. § 103(a), as unpatentable over Schmidt, Welker, Brunet, Bellingham and any of Ray, Rouquette, DeKok, and Dragoset.

Rejections VI and VII

Independent claims 10 and 11 also require "first plural buoys," and "launching, along the starting line, first plural buoys from a first vessel" or "a first vessel configured to launch the first plural buoys" (Appeal Br. 49, 50 (Claims App.)), and the Examiner relies on the same findings from Schmidt in the rejection of claims 10 and 11 as the Examiner relied upon in the rejection of claim 1 *supra*. *See* Non-Final Act. 18–28. Thus, for the same reasons stated *supra*, we do not sustain the Examiner's rejection of claims 10 as unpatentable over Schmidt, Welker, Brunet, and Bellingham and 11, and claim 14 depending from claim 11, under 35 U.S.C. § 103(a), as unpatentable over Schmidt, Welker, and Bellingham.

Rejections VIII–X

Claims 13, 15, and 16 depend from independent claim 11. The Examiner's findings with respect to Rouquette and Bogue fail to cure the deficiencies in the Examiner's findings with respect to Schmidt as discussed *supra*. *See* Non-Final Act. 28–30. Therefore, we also do not sustain the Examiner's rejections of claims 13, 15, and 16, under 35 U.S.C. § 103(a), as unpatentable over Schmidt, Welker, Bellinghamand either Rouquette or Bogue.

Rejection XI

Independent claims 21 and 23 also require "first plural buoys," and "a first vessel configured to launch the first plural buoys" (Appeal Br. 52, 53 (Claims App.)), and the Examiner relies on the same findings from Schmidt in the rejection of claims 21 and 23 as the Examiner relied upon in the rejection of claim 1 *supra*. *See* Non-Final Act. 18–28. Claim 17 depends from claim 11, and we do not sustain claim 11, as set forth *supra*. Thus, for the same reasons stated *supra*, we do not sustain the Examiner's rejection of claims 17, 21, and 23, under 35 U.S.C. § 103(a), as unpatentable over Schmidt, Welker, Bellingham, and DeKok.

Rejection XII

Independent claims 22 and 24 also require "first plural buoys," and "a first vessel configured to launch the first plural buoys" (Appeal Br. 52–53, 54–55 (Claims App.)), and the Examiner relies on the same findings from Schmidt in the rejection of claims 22 and 24 as the Examiner relied upon in the rejection of claim 1 *supra*. *See* Non-Final Act. 43–54. Claim 18

depends from claim 11, and we do not sustain claim 11, as set forth *supra*. Thus, for the same reasons stated *supra*, we do not sustain the Examiner's rejection of claims 18, 22, and 24, under 35 U.S.C. § 103(a), as unpatentable over Schmidt, Welker, Bellingham, and Dragoset.

Rejection XIII

Independent claim 25 also requires "first plural buoys," and "a first vessel configured to launch the first plural buoys" (Appeal Br. 55 (Claims App.)), and the Examiner relies on the same findings from Schmidt in the rejection of claim 25 as the Examiner relied upon in the rejection of claim 1 *supra*. *See* Non-Final Act. 55–61. Claim 19 depends from claim 11, and we do not sustain claim 11, as set forth *supra*. Thus, for the same reasons stated *supra*, we do not sustain the Examiner's rejection of claims 19 and 25, under 35 U.S.C. § 103(a), as unpatentable over Schmidt, Welker, Bellingham, and Vigen.

NEW GROUNDS OF REJECTION

Rejection I — Claims 1, 5, 7, and 10, under 35 U.S.C. § 103(a) as unpatentable over Bogue, Schmidt, and Brunet

Independent claim 1

Regarding independent claim 1, we find that Bogue discloses first plural buoys configured to descend in water to a predetermined depth (H1), each having a receiver[6] for recording data. In support, Bogue discloses

[6] *See* Spec. ¶ 33 ("The seismic receivers may include . . . a hydrophone.").

> QUEphones are specially modified APEX profiling floats, equipped with single omni-directional hydrophone and internal recorder-detector electronics. They are designed to be neutrally-buoyant at a specified depth (density surface), park there for a specified time then profile during the ascent to the surface for data telemetry.

Bogue, p. 13, Fig. 9. Thus, the QUEphones, or profiling floats, are buoys. This passage from Bogue also describes the QUEphones as having a buoyancy system for maintaining the position of the profiling floats at a desired depth.

We also find that Bogue discloses a first vessel configured to launch the first plural buoys along a first line, and a second vessel configured to recover the first plural buoys at a second line, wherein there is a predetermined distance between the first and second lines, as required by claim 1. In other words, the buoys are launched to follow a path underwater along a distance (D) between the first and second vessels. In support, Bogue discloses that "QUEphones are typically deployed . . . from the deck of a ship" and "recovered via [a] small boat." Bogue, p. 13. Bogue further discloses that

> [t]he ocean currents will be determined prior to deployment [of the QUEphones]. This determination will be critical to picking the launch position in order to keep the QUEphones within the assigned water-space. . . . [T]he initial plan is to deploy the two QUEphones at the southern end of the SOAR range area. The instrument's neutrally-buoyant depth will be set to about 1000 m. They will stay at this depth for about 16 hours/day and drift with the current. . . . The ocean currents will be monitored throughout the exercise, and the QUEphones. . . . will be repositioned or recovered if necessary. Note that if the current at

> the neutrally-buoyant depth is 10 cm/sec, a QUEphone drifts 35 km in 4 days.

Id. at p. 18. Thus, we determine that Bogue discloses a first vessel (or ship) configured to launch the first plural buoys (or two QUEphones) along a first line (i.e., the line between the deployed QUEphones), which is predetermined as the launch position. We further determine that Bogue discloses a second vessel (or small boat) configured to recover the first plural buoys (or two QUEphones) at a second line (i.e., the line between the QUEphones after traveling underwater and resurfacing), which is a distance from the first line based on ocean currents and the speed that the QUEphones drift at a certain depth per unit time. The distance is predetermined to maintain the QUEphones within the range area.

This disclosure from Bogue also supports a finding that the first plural buoys (or two QUEphones) are configured to travel underwater from the first line to the second line due to the underwater currents, as claimed, and also that the distance between the first and second lines is predetermined based on the distance the QUEphones drift due to ocean currents, in order to maintain the QUEphones within the range area. *See also* Bogue, p. 18 ("[s]ince the QUEphones are passive, they drift with the prevailing ocean current at their neutrally-buoyant depth.").

Bogue does not disclose, however, that the QUEphones have an on-board (or active) propulsion system, for adjusting its horizontal position or to maintain a given position underwater while recording the seismic data. However, Schmidt discloses an oceanographic sampling system and method

wherein "[t]wo or more underwater vehicles are disposed in an array," and that "[e]ach underwater vehicle includes a propulsion system for moving the underwater vehicle independently of the other ones of the underwater vehicles." Schmidt 3:44–48. As stated *supra*, Schmidt discloses that the underwater vehicle "may move to any X-Y coordinates and depth within the ocean volume being monitored" (*id.* at 6:32–35) and that the propulsion system is used to adjust or maintain the position of the underwater vehicle underwater, in that "CPU **120** may compare the position data provided by the navigation subsystem **140** with a desired position and issue corrections to the propulsion motor **90**" (*id.* at 7:61–64).[7]

Thus, we determine that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Bogue's two-device array comprised of profiling floats to include profiling floats having a propulsion system for adjusting the horizontal position of the profiling float or to adjust or maintain the underwater vehicle while recording data, as claimed, in order to provide a greater degree of control over the movements of the profiling floats during the exercise, as taught by Schmidt. For example, Bogue discloses the need to reposition the profiling floats in the event the profiling floats are off-course or outside of the assigned water-space due to the currents. *See* Bogue, p. 18. Thus, the

[7] Notably, Bogue also discloses different types of passive autonomous acoustic monitoring program systems, including "three types of buoyancy-driven underwater gliders, an autonomous surface platform, and two types of freely drifting profiling floats" (Bogue, pp. 2–3), wherein at least the Waveglider is disclosed as having a propulsion system (*id.* at p. 12).

profiling floats of Bogue, as modified to include a propulsion system as taught by Schmidt, would be configured to move due to a combination of underwater currents *and* a propulsion system, as claimed.

Although Bogue discloses that the array of two QUEphones is used to monitor marine mammals in an assigned water-space, and not for conducting a seismic survey, wherein the hydrophones record seismic data, as claimed (Bogue, Title ("Passive Autonomous Acoustic Monitoring of Marine Mammals"), p. 18), Schmidt discloses that it is known to use mobile arrays of underwater vehicles in "a wide variety of potential applications including . . . [o]ffshore oil exploration . . . , initial seismic surveys for resources, . . . [and] tracking marine mammals." Schmidt 10:21–32. Therefore, we determine that it would have been obvious to one of ordinary skill in the art at the time of the invention to have used the array of QUEphones, as described in Bogue, as a seismic survey system to record seismic data, as taught by Schmidt.

As set forth *supra*, Bogue discloses the need to determine ocean currents prior to launching the QUEphones. Bogue does not, however, disclose a computer system configured to calculate the underwater currents prior to launching the first plural buoys and to determine a position of the second line, as claimed. Rather, Bogue discloses that "[b]y deploying the gliders first, they can be used to assess the prevailing ocean currents prior to deployment of the freely drifting profiling floats" (Bogue, p. 16), and that this information is critical to determining the launch (and therefore, the recovery lines) to keep the QUEphones within the assigned water-space (*id.*

at p. 18). Brunet suggests another way to assess the prevailing ocean currents, namely, by computer simulation. Brunet, Abstract. Brunet also discloses that the computer system may calculate underwater currents based on historic data. *See* Brunet 2:28, 53, 3:6–7 (the method includes selecting a current object as a function of the intended application, wherein a type of current object may be "a history of past extrapolations of the total current as measured by current meter").

Thus, we determine that it would have been obvious to one skilled in the art at the time of the invention to substitute Bogue's method of determining ocean currents with the computer simulation taught in Brunet. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) ("when [an application] claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result") (citing *United States v. Adams*, 383 U.S. 39, 50–51 (1966)).

Further, claim 1 requires the computer system to be configured to determine a position of the second line. Appeal Br. 30 (Claims App.). Because Bogue discloses that the determination of the ocean current is "critical to picking the launch position in order to keep the QUEphones within the assigned water-space" and that "[t]he ocean currents [are] monitored . . . and the QUEphones . . . repositioned or recovered if necessary" (Bogue, p. 18), Bogue teaches that the determination of the ocean current is also critical to determining the finish line, in that it is used to ensure the finish line is within the assigned water-space. Thus, the

modification of Bogue, in view of Brunet, would result in a computer assessing currents to determine a position of the second line (i.e., the line where the QUEphones are recovered).

Alternatively, as reasoned by the Examiner, it would have been obvious to use a computer system, as taught by Brunet, to predict currents for the planned deployment of profiling floats, as disclosed by Bogue, "since such combination enables more reliable prediction of where there may be gaps in the data in the absence of steps taken to improve coverage" of the assigned water-space. Non-Final Act. 11.

Accordingly, we reject independent claim 1, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet.

Dependent claim 5

Claim 5 depends from claim 1, and further recites "wherein the predetermined distance is larger than 10 km." Appeal Br. 48 (Claims App.). Bogue discloses that a predetermined distance between the launch and recovery lines is 35 km. Bogue, p. 18 ("Note that if the current at the neutrally-buoyant depth is 10 cm/sec, a QUEphone drifts 35 km in 4 days.).

Accordingly, we reject claim 5, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet.

Dependent claim 7

Claim 7 depends from claim 1, and further recites that "the computer system is configured to receive current positions of the plural buoys, and to calculate new trajectories of the underwater currents based on the current positions of the first plural buoys." Appeal Br. 48 (Claims App.). Bogue

discloses that "[the] progress [of the QUEphones or profiling floats] will be monitored 24/7 [(continuously)]" and also that "[t]he ocean currents will be monitored throughout the exercise, and the QUEphones . . . will be repositioned or recovered if necessary." Bogue, p. 18. In other words, Bogue teaches that data regarding the current positions of the profiling floats and also the ocean currents is collected throughout the exercise, and used to reposition the floats. One skilled in the art would appreciate that such repositioning would involve calculating new trajectories of the underwater currents to maintain the finish line within the assigned water-space, according to the planned exercise, as taught in Bogue. Moreover, Brunet teaches using computer simulation to determine variations in the current over time and space (Brunet, Abstract), and, in real time, "to provide the ship with navigation assistance so as to continuously adjust the track of the ship so that at each instant the orientation of the streamers is as close as possible to their orientation at the same level . . . during the pass of the ship over the previously surveyed adjacent line" (*id.* at 9:4–11). Thus, we determine that it would have been obvious to one of ordinary skill in the art to receive current positions of the first plural buoys, as disclosed in Bogue, and to calculate new trajectories of the underwater current positions, as taught by Brunet, to maintain the buoys within the assigned water-space.

Accordingly, we reject claim 7, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet.

Independent claim 10

Regarding independent claim 10, to the extent claim 10 recites the same claim limitations as are recited in claim 1, we apply the same findings and reasoning to claim 10 as applied to claim 1 *supra*. Claim 10 further requires "determining trajectories of the underwater currents based on historic data" (Appeal Br. 49 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as applied to claim 7 *supra*.

Claim 10 also requires selecting starting and finish lines for the first plural buoys, which are substantially perpendicular to the underwater currents. Appeal Br. 49 (Claims App.). As discussed *supra*, Bogue discloses that "ocean currents will be determined prior to deployment" of the two QUEphones and that "[t]his determination will be critical to picking the launch position in order to keep the QUEphones within the assigned water-space." Bogue, p. 18. In other words, Bogue discloses that the start and finish positions are known result-effective variables when designing the plan for monitoring an assigned water-space using profiling floats that drift within underwater currents. Accordingly, selecting starting and finish lines for the profiling floats that are substantially perpendicular to the underwater currents would have been a matter of routine optimization for one having ordinary skill in the art at the time of the invention. As the Examiner explains, "first and second lines that are substantially perpendicular to the current maximize the survey area." Ans. 11. In other words, deploying the QUEphones in a line substantially perpendicular to the underwater currents

results in the QUEphones being horizontally distributed across the area of the assigned water-space, rather than deploying the QUEphones in a line substantially parallel to the underwater currents, wherein one QUEphone would travel at a distance along the line behind the other.

Accordingly, we reject independent claim 10, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet.

Rejection II — Claims 2, 3, 4, 8, 9, 21, and 22, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet, and alternatively, also including DeKok and/or Dragoset.

Dependent claims 2, 3, 8, and 9

Claims 2, 3, 8, and 9 depend from independent claim 1, and require, in relevant part, wherein the first vessel is configured to launch second plural buoys along the first line, later in time than the first buoys (claim 2), or waves of buoys to cover a desired area for collecting the seismic data (claim 2), or second plural buoys configured to descend to a second predetermined depth in water (claim 8) or to form a variable-depth profile (claim 9). Appeal Br. 30–34 (Claims App.). Schmidt discloses that the following variables are known to be result-effective when designing arrays of underwater vehicles (or mission profiles):

> a variety of mission profiles may be utilized with the mobile underwater arrays of the present invention. The mission profile is defined by a number of parameters, including the shape of the AUV array (straight line, curved, V-shaped, etc.), *the size of the array* (the number of AUVs and spacing between AUVs), the *orientation of the array* (vertical, horizontal, etc.) the depth of

> array in the ocean volume of interest, the direction of movement of the AUV array, the speed of the AUV array, and any other parameters that are required to define a particular mission.

Schmidt 9:49–59 (emphasis added). As stated *supra*, Bogue discloses that the profiling floats are launched by a ship and also that the neutrally-buoyant depth of each profiling float may be separately determined. *See* Bogue, p. 18 ("The instrument's neutrally-buoyant depth will be set to about 1000 m"). Thus, we determine that it would have been obvious to one skilled in the art at the time of the invention to launch a second set of QUEphones later in time than Bogue's first two QUEphones, or to launch the QUEphones in waves, in order to create a larger horizontal array for monitoring the assigned water-space, in view of Schmidt's teaching that the size of the array and orientation of the array (i.e., a horizontal array) are known result-effective variables for monitoring arrays. Further, we determine that it would have been obvious to one skilled in the art at the time of the invention to configure a second set of QUEphones to descend to a predetermined depth other than 1000 m to form a vertical array or a variable-depth profile for monitoring the assigned water-space, in view of Schmidt's teaching that the size of the array and orientation of the array (i.e., a vertical array) are known result-effective variables for monitoring arrays. This flexibility is recognized in the art, as stated *supra*, when using profiling floats in an array, as taught by Bogue, for conducting a seismic survey.

Additionally, Schmidt teaches that "[a]rrays of hydrophones are widely used," and that "[m]ultiple hydrophones may be spaced along a cable towed behind a ship to form a towed array." Schmidt 2:42–44. Noting that

such towed arrays have "fixed configurations" and "may be difficult to maneuver," Schmidt discloses "an oceanographic sampling system compris[ing] a plurality of underwater vehicles disposed in an array having an array configuration." Schmidt 2:48–50, 64–67. In other words, as determined by the Examiner, Schmidt teaches one skilled in the art that underwater arrays are a substitute for, and improvement over, towed arrays. *See* Non-Final Act. 17 ("[Schmidt] suggests that the set of buoys form the equivalent of a traditional streamer."). The Examiner relies on DeKok for teaching "underwater seismic sensors arranged in quasi over/under configuration" (*id.* at 16 (citing DeKok, Abstract, 8:10–9:25, Figs. 2A, 9A, 9C)) and further on Dragoset for teaching "seismic sensors disposed underwater along a slanted profile" (*id.* at 17 (citing Dragoset, Abstract, Fig. 1)). Thus, in view of the Examiner's findings, we further determine that it would have been obvious to one skilled in the art at the time of the invention to use multiple profiling floats, as disclosed in Bogue, which are deployed at different time intervals, for example in waves, to create a horizontal array, and/or set to different neutrally-buoyant depths to create a vertical array, or a combination thereof, in order to form equivalent configurations of hydrophone arrays, as are employed via streamers, as taught by Schmidt, and DeKok or Dragoset.

Accordingly, we reject claims 2, 3, 8, and 9 under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet, and alternatively, also including DeKok and/or Dragoset.

Dependent claim 4

Claim 4 depends from claim 2, and further recites "wherein the second vessel is configured to move back and forth along the second line to recover the second plural buoys." Appeal Br. 48 (Claims App.). We determine that it would have been obvious to one skilled in the art to move Bogue's recovery vessel along the finish line in a first instance to recover the QUEphones launched as first plural buoys, and to move Bogue's recovery back, in the reverse direction, along the finish line in a second instance to recover the QUEphones launched as second plural buoys later in time than the first plural buoys, which are drifted in the same underwater currents as the first plural buoys. (Notably, as set forth *supra*, Bogue's launch plan for the QUEphones, as modified by Schmidt, or Schmidt and DeKok and/or Dragoset, includes second plural buoys launched later in time, to form a horizontal array, as recited in claim 2.) Such movement of Bogue's recovery vessel would be an efficient manner in which to recover buoys floating across a finish line at two different time intervals, and such movement would also be within the knowledge of one skilled in the art. In other words, we agree with the Examiner that "such practice . . . [is] simply a matter of design choice in the marine seismic survey." Non-Final Act. 13.

Accordingly, we reject claim 4, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet, and alternatively, also including DeKok and/or Dragoset.

Independent claim 21

Regarding independent claim 21, to the extent claim 21 recites the same claim limitations as are recited in claim 1, we apply the same findings and reasoning to claim 21 as applied to claim 1 *supra*. Claim 21 further recites "second plural buoys configured to descend to a second predetermined depth in water" (Appeal Br. 52 (Claims App.), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 8 *supra*.

Accordingly, we reject independent claim 21, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet, and alternatively, also including DeKok and/or Dragoset.

Independent claim 22

Regarding independent claim 22, to the extent claim 22 recites the same claim limitations as are recited in claim 1, we apply the same findings and reasoning to claim 22 as applied to claim 1 *supra*. Claim 22 further recites that "second plural buoys [are] configured to descend in water to form a variable-depth profile" (Appeal Br. 52–53 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 9 *supra*.

Accordingly, we reject independent claim 22, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet, and alternatively, also including DeKok and/or Dragoset.

Rejection III — Claims 11, 13, 14, and 16, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker

Independent claim 11

Regarding independent claim 11, to the extent claim 10 recites the same claim limitations as are recited in claim 1, we apply the same findings and reasoning to claim 11 as applied to claim 1 *supra*.

Claim 11 further requires that the first plural buoys are configured to descend "at a given position in a plane substantially parallel with a water surface." Appeal Br. 49 (Claims App.). The Examiner found that because Schmidt teaches that "the depth for operation [(of the AUVs)] can be fixed and preprogrammed, . . . maintaining a preprogrammed depth implies a position in a horizontal plane, i.e., substantially parallel with a water surface." Non-Final Act. 24–25 (citing Schmidt 5:28–37). We agree. Moreover, Schmidt discloses that the depth of the AUVs within the array is a result-effective variable, and we determine that it would have been obvious to one skilled in the art at the time of the invention to design an array wherein Bogue's two QUEphones descend to the same depth. Additionally, Bogue discloses that the neutrally-buoyant depth of the two QUEphones is set to about 1000 m, such that "[t]hey will stay at this depth . . . and drift with the current." Bogue, p. 18. Thus, Bogue's two QUEphones are configured to descend at a given position (1000 m below the water's surface) in a plane substantially parallel with the water's surface, and therefore, Bogue teaches this limitation of claim 11.

Independent claim 11 also recites "a first acoustic system attached to the first vessel and configured to detect a position of the at least one buoy while underwater; and a second acoustic system attached to the second vessel and configured to detect the position of the at least one buoy while underwater." Appeal Br. 50 (Claims App.). The Examiner found that Welker teaches "providing acoustic positioning to the underwater apparatus from a first vessel." Non-Final Act. 26 (citing Welker ¶¶ 25, 49–50). Indeed, Welker discloses that "communications also can be achieved through underwater acoustic . . . telemetry to either the survey vessel or wave glider [(underwater vehicle)]" and that "[o]btaining a position for the sub-surface glider through active or passive acoustic distance measurement and subsequent communication to the sub-surface glider allows an operator on the surface survey vessel to control the trajectory of the sub-surface glider." Welker ¶ 25. Welker also discloses that "[t]racking of the self-propelled underwater vehicle **20** by the surface vessel **66** . . . can be achieved with various acoustic positioning systems." *Id.* ¶ 47. Welker discloses that the surface control unit may send messages to the underwater vehicles "in the form of an acoustic signal transmitted from the vessel **66**." *Id.* ¶ 50. Thus, Welker discloses determining the current positions of underwater vehicles based on an acoustic system and also that an acoustic system is installed on the surface vessel. Further, Bogue discloses that the QUEphones "profile during the ascent to the surface for data telemetry," or in other words, are intended to communicate data at the surface with another device. Bogue, p. 13. Thus, in view of the Examiner's findings and

teachings of Welker, we determine that it would have been obvious to one of ordinary skill at the time of the invention to provide the launch and recover boats of Bogue with an acoustic system for communicating with Bogue's QUEphones to determine their current positions, in order to facilitate their deployment and recovery. *See* Bogue, p. 13.

Accordingly, we reject claim 11, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker.

Dependent claims 13

Claim 13 depends from claim 11, and further recites "wherein a horizontal distance (d) between two adjacent buoys of the set of buoys is between 10 m and 200 m and the distance (D) is about 10 km." Appeal Br. 50 (Claims App.). As discussed *supra*, Schmidt expressly discloses that the "spacing between AUVs" is recognized as result-effective variable for underwater vehicle monitoring arrays. Schmidt 9:49–59. Thus, we determine that it would have been obvious to one skilled in the art at the time of the invention to design an array wherein Bogue's two QUEphones are separated horizontally by 10 to 200 m, depending upon the requirements for monitoring the assigned water-space. Additionally, the Examiner found, and we agree, that because Schmidt teaches "a communication system between underwater apparatus with a required range of about 10 to 20 m," Schmidt suggests that "a horizontal distance (d) between two adjacent buoys of the set of buoys is between 10m and 200 m." Non-Final Act. 28. Regarding distance (D), we note that the distance (D) between the first and second vessels is analogous to the predetermined distance between the first

and second lines of claim 1, and apply our findings and reasoning as stated *supra* with respect to claim 5.

Accordingly, we reject claim 13, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker.

Dependent claim 14

Claim 14 depends from claim 11, and further recites "wherein the set of buoys form the equivalent of a traditional streamer." Appeal Br. 50 (Claims App.). As discussed *supra*, Schmidt teaches that "[a]rrays of hydrophones are widely used," and that "[m]ultiple hydrophones may be spaced along a cable towed behind a ship to form a towed array." Schmidt 2:42–44. Noting that such towed arrays have "fixed configurations" and "may be difficult to maneuver," Schmidt discloses "an oceanographic sampling system compris[ing] a plurality of underwater vehicles disposed in an array having an array configuration." Schmidt 2:48–50, 64–67. In other words, as determined by the Examiner, Schmidt teaches one skilled in the art that underwater arrays are a substitute for, or an equivalent of, towed arrays. *See* Non-Final Act. 21, 28 ("[Schmidt] suggests that the set of buoys form the equivalent of a traditional streamer.").

Accordingly, we reject claim 14, under 35 U.S.C. §103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker.

Dependent claim 16

Claim 16 depends from claim 11, and further recites "wherein the first predetermined depth (H1) is larger than a depth is about 200 m or more." Appeal Br. 51 (Claims App.). Bogue discloses a predetermined depth (H1)

for the profiling floats of 1000 m, which is within the range of about 200 m or more. *See* Bogue, p. 18.

Accordingly, we reject claim 16, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker.

Rejection IV — Claim 15, under 35 U.S.C. §103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker, and Robertsson and/or DeKok

Dependent claim 15

Claim 15 depends from claim 11, and further recites "wherein the first predetermined depth (H1) is larger than a depth of a traditional streamer." Appeal Br. 51 (Claims App.). As stated *supra*, Bogue discloses a predetermined depth (H1) for the profiling floats of 1000 m. *See* Bogue, p. 18. The Examiner found that Robertsson teaches "a traditional streamer depth to be 6-10 m" (Non-Final Act. 30 (citing Robertsson 6:54–57), and we also note that DeKok discloses streamer depths of 23.44 and 31.25 meters. DeKok 6:54, 56. Because Bogue's disclosure of 1000 meters is at least ten times greater than the streamer depths disclosed in Robertsson and DeKok, we conclude that Bogue teaches that the depth (H1) of the QUEphones is larger than the depth of a traditional streamer, as required by claim 15.

Accordingly, we reject claim 15 under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker, and Robertsson and/or DeKok.

Rejection V — Claims 17, 18, 23, and 24, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker, and alternatively, DeKok and/or Dragoset.

Dependent claims 17 and 18

Claims 17 and 18 depend from claim 11, and further recite "second plural buoys configured to descent to a second predetermined depth (H2) in water" or "to form a variable-depth profile." Appeal Br. 51 (Claims App.). Regarding these limitations, we apply the same findings and reasoning to claims 17 and 18 as applied to claims 8 and 9 *supra*.

Claims 17 and 18 further recite "wherein the first and second plural buoys span a distance (D) between the first vessel and the second vessel." The Examiner determined that "it is inherent that buoys launched from a first boat . . . and retrieved by a second boat . . . would have to be between the two boats" (Non-Final Act. 31, 43), which Appellants do not dispute. *See* Appeal Br. 19–45; Reply Br. 2–7. In support, we note that, as discussed *supra*, Bogue discloses that the QUEphones travel within the distance between the launch and recovery vessels, and therefore, we agree with the Examiner that the QUEphones must necessarily span (or bridge) that distance.

Accordingly, we reject claims 17 and 18, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker, and alternatively, also including DeKok and Dragoset.

Independent claim 23

Regarding independent claim 23, to the extent claim 23 recites the same claim limitations as are recited in claim 1, we apply the same findings and reasoning to claim 23 as applied to claim 1 *supra*. Claim 23 further recites that the first plural buoys are configured to "at a given position in a plane substantially parallel with a water surface" (Appeal Br. 53 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 11 *supra*. Claim 23 also recites first and second acoustic systems attached to the first and second vessels (*id.* at 54 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 11 *supra*. Claim 23 further recites "second plural buoys configured to descend to a second predetermined depth (H2) in water" (*id.*), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 8 *supra*. Finally, claim 23 recites "wherein the first and second plural buoys span a distance (D) between the first vessel and the second vessel" (*id.* at 54 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 17 *supra*.

Accordingly, we reject claim 23 under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker, and alternatively, DeKok and/or Dragoset.

Independent claim 24

Regarding independent claim 24, to the extent claim 24 recites the same claim limitations as are recited in claim 1, we apply the same findings

and reasoning to claim 24 as applied to claim 1 *supra*. Claim 24 further recites first and second acoustic systems attached to the first and second vessels (*id.* at 54 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 11 *supra*. Claim 24 further recites "second plural boys configured to descend in water to form a variable-depth profile" (*id.* at 54–55 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 9 *supra*. Claim 24 also recites "wherein the first and second plural buoys span a distance (D) between the first vessel and the second vessel" (*id.* at 55 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 17 *supra*.

Accordingly, we reject claim 24 under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker, and alternatively, DeKok and/or Dragoset.

Rejection VI — Claims 19 and 25 under 35 U.S.C. § 103(a) as unpatentable over Bogue, Schmidt, Brunet, Welker, and Vigen

Dependent claim 19

Claim 19 depends from claim 11, and further recites "wherein each of the first and second acoustic systems includes at least two acoustic pingers,[8]

[8] An ordinary definition of the claim term "pinger," in consistent with the Specification, is "a device that produces pinging noises, especially one used as part of underwater detection equipment." MICROSOFT ENCARTA COLLEGE

each pinger being configured to emit an acoustic wave with a unique frequency." Appeal Br. 51 (Claims App.). The Examiner found that Vigen teaches "multiple pingers on a single vessel each having distinctive signals" and concluded that "one of ordinary skill in the art would appreciate that unique frequencies can be utilized" (Non-Final Act. 55 (citing Vigen, 7:20–32, 45–47)), and that the use of the pingers, as claimed, is an obvious matter of design choice.

Indeed, Vigen discloses that "[t]wo or more acoustic transmitters **1** are fitted onto the hull of the cable deployment vessel **3** riding on sea surface **5**" (Vigen 7:20–21) and that "[w]hen the system is operated, transmitters **1** send synchronized broad spectrum and coded signals" (*id.* at 7:45–46). Vigen further discloses that "a multitude of transmitters **1** send[] different signals that are received by one or more receivers **2**" (*id.* at 7:57–60), wherein "the seismic receivers on or in the cable must be transponders or transducers capable of receiving and transmitting acoustic signals" (*id.* at 8:1–3). Further, Vigen states that "[u]seful transmitters **1** are those able to transmit spread spectrum signals that are unique acoustic signals lying within a frequency band that receivers **2** (hydrophones) are capable of detecting." *Id.* at 9:18–21. Bogue discloses that "pingers" are not required on the platforms for sub-surface tracking, and thus, Bogue teaches one skilled in the art that pingers are an option for sub-surface tracking, and Bogue's profiling floats are disclosed as a sub-surface device. Bogue, p. 21. Thus, we determine

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that it would have been obvious to one skilled in the art to provide first and second acoustic systems on Bogue's launch and recovery vessels, as discussed *supra* with respect to claim 11, and also to design the systems to include at least two acoustic pingers configured to emit an acoustic wave with a unique frequency, because Bogue suggests that pingers may be used (although they are not required) to track the sub-surface devices and Schmidt discloses that the arrays may be expanded horizontal and vertically, whereby additional pingers with unique frequency emissions may be helpful.

Accordingly, we reject claim 19 under 35 U.S.C. § 103(a) as unpatentable over Bogue, Schmidt, Brunet, Welker, and Vigen.

Independent claim 25

Regarding independent claim 25, to the extent claim 25 recites the same claim limitations as are recited in claim 1, we apply the same findings and reasoning to claim 25 as applied to claim 1 *supra*. Claim 25 further recites first and second acoustic systems attached to the first and second vessels (*id.* at 55 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 11 *supra*. Claim 25 further recites "wherein each of the first and second acoustic systems includes at least two acoustic pingers, each pinger being configured to emit an acoustic wave with a unique frequency" (*id.* at 56 (Claims App.)), and we apply the same findings and reasoning with respect to this claim limitation as we applied to claim 19 *supra*.

Accordingly, we reject claim 25 under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, Welker, and Vigen.

DECISION

The Examiner's decision to reject claims 1–5, 7–11, 13–19, and 21–25, under 35 U.S.C. § 103(a), is REVERSED.

We enter the following NEW GROUNDS OF REJECTION:

I. Claims 1, 5, 7, and 10, under 35 U.S.C. § 103(a) as unpatentable over Bogue, Schmidt, and Brunet.

II. Claims 2, 3, 4, 8, 9, 21, and 22, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, and Brunet, and alternatively, also including DeKok and/or Dragoset.

III. Claims 11, 13, 14, and 16, under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker.

IV. Claims 15 under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker, and Robertsson and/or DeKok.

V. Claims 17, 18, 23, and 24 under 35 U.S.C. § 103(a), as unpatentable over Bogue, Schmidt, Brunet, and Welker, and alternatively, DeKok and/or Dragoset.

VI. Claims 19 and 25 under 35 U.S.C. § 103(a) as unpatentable over Bogue, Schmidt, Brunet, Welker, and Vigen.

This decision contains new grounds of rejection pursuant to 37 C.F.R. § 41.50(b).

37 C.F.R. § 41.50(b) provides "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review." 37 C.F.R. § 41.50(b) also provides:

When the Board enters such a non-final decision, the appellant, within two months from the date of the decision, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

> (1) *Reopen prosecution.* Submit an appropriate amendment of the claims so rejected or new Evidence relating to the claims so rejected, or both, and have the matter reconsidered by the Examiner in which event the prosecution will be remanded to the Examiner. The new ground of rejection is binding upon the examiner unless an amendment or new Evidence not previously of Record is made which, in the opinion of the examiner, overcomes the new ground of rejection designated in the decision. Should the examiner reject the claims, appellant may again appeal to the Board pursuant to this subpart.
>
> (2) *Request rehearing.* Request that the proceeding be reheard under § 41.52 by the Board upon the same Record. The request for rehearing must address any new ground of rejection and state with particularity the points believed to have been misapprehended or overlooked in entering the new ground of rejection and also state all other grounds upon which rehearing is sought.

Further guidance on responding to a new ground of rejection can be found in the Manual of Patent Examining Procedure § 1214.01.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

REVERSED; 37 C.F.R. § 41.50(b)